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(54) **Tubular connector with screw-threaded inserts**

(57) A galvanised tubular connector for a handrail or balustrade has a tubular body 25 (figure 3) with two openings 26 that receive inserts 28 internally screw-threaded 23 to receive grub screws. Each insert 28 is fitted into the opening 26 from within the body 25 and is held captive against rotation and is prevented from passing directly through the opening. For this purpose the insert may be fustro-conical and a press-fit in the opening 26. Alternatively the insert may have a non-circular cross-section, be provided with a groove 36 (figure 5) or include lugs 42 (figure 7).

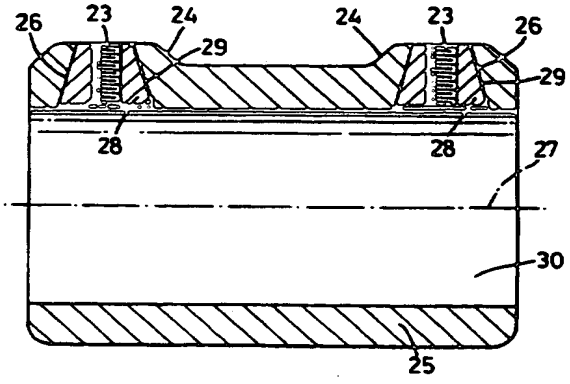


Fig. 3

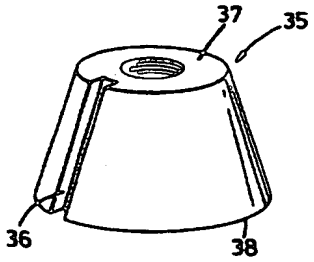


Fig. 5

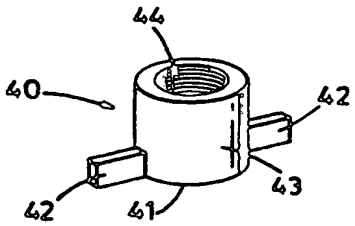


Fig. 6

At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

The claims were filed later than the filing date within the period prescribed by Rule 25(1) of the Patents Rules 1995

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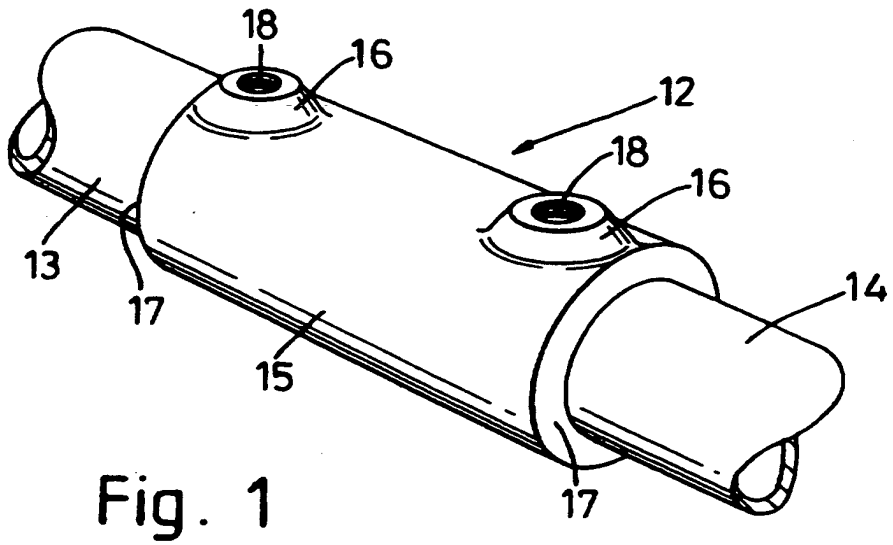


Fig. 1
(PRIOR ART)

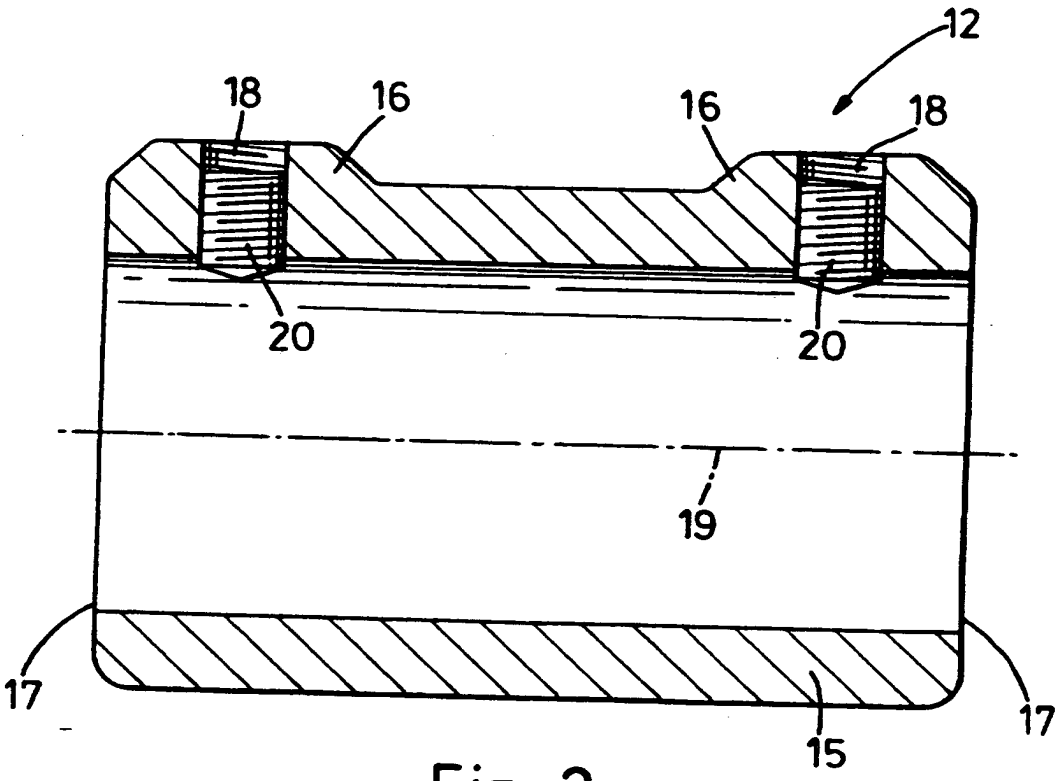


Fig. 2
(PRIOR ART)

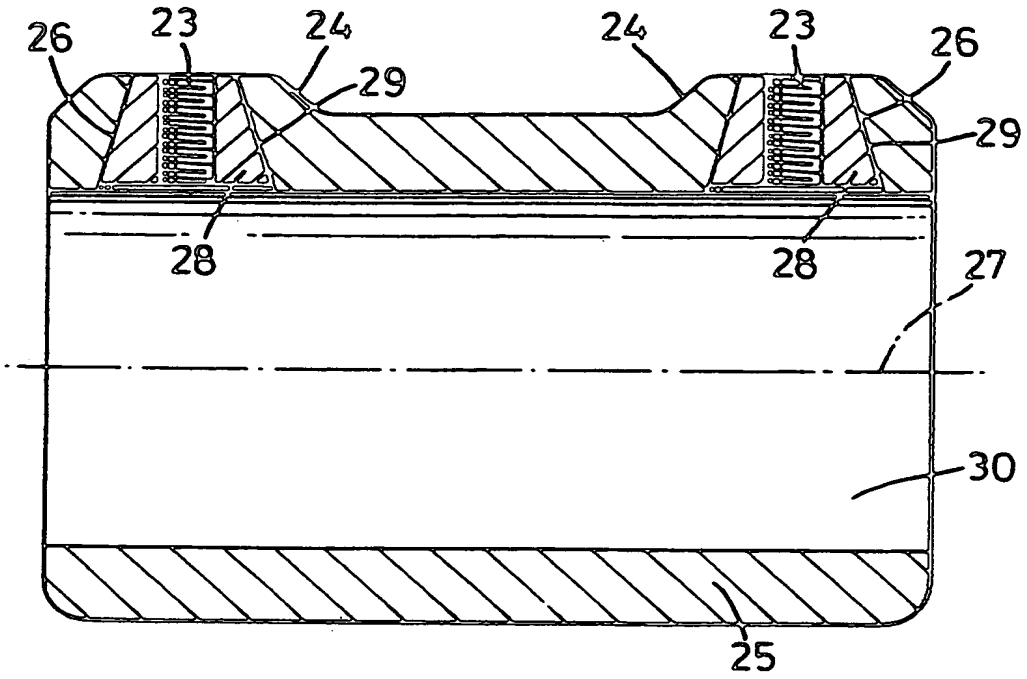


Fig. 3

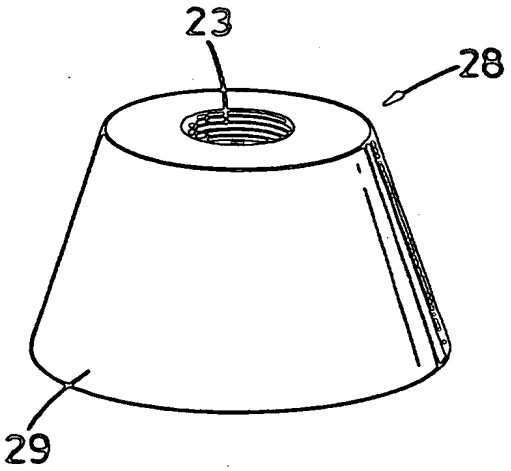


Fig. 4

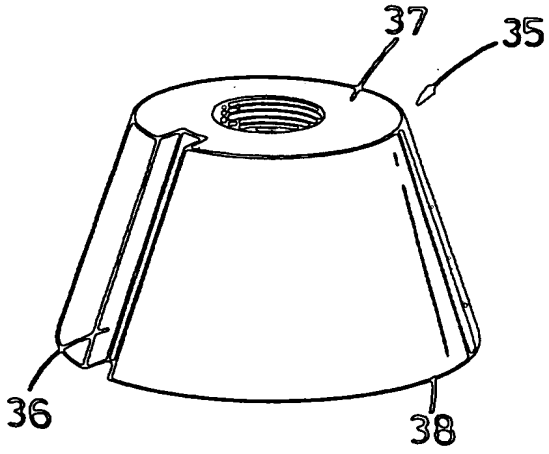


Fig. 5

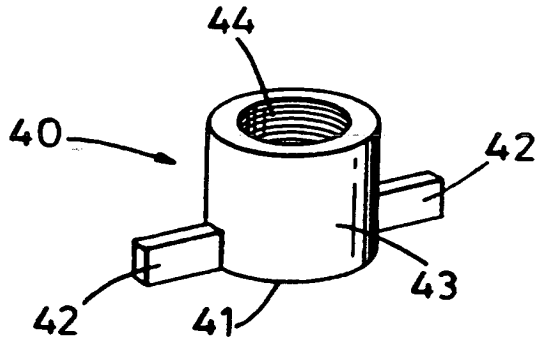


Fig. 6

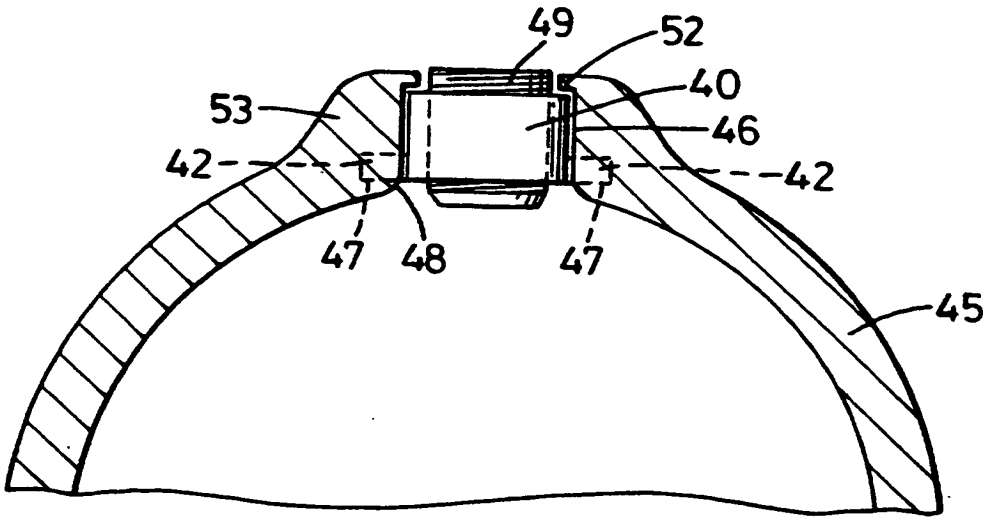


Fig. 7

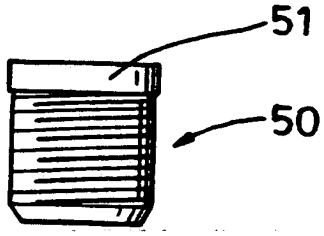


Fig. 8

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"CONNECTOR DEVICE"

The invention relates to a tubular connector device suitable for use in forming a structural interconnection between an end of an elongate member and a second member which may, for example, also be an elongate member. It relates in particular, although not exclusively, to a connector of a kind having a protective coating.

A connector device of the aforedescribed type often is used to interconnect two or more metal tubes or rods that form part of a handrail or balustrade installation, or to form a structural connection to a support such as a wall or floor. Commonly the connector device is formed of cast iron which is galvanised to provide corrosion resistance.

For securing the connector device to the end of a tube or rod it is customary to provide a drilled and tapped opening in a cylindrical portion of the connector device. Locking means such as a grub screw is located in that opening and can be tightened to bear firmly against an outer surface of the metal tube. This is a long established assembly technique which works efficiently.

In more severe environments corrosion can arise after a period of time at the unprotected screw thread surface of the tapped opening. This is visually undesirable and, in the event of an assembly requiring to be dismantled or modified, additional time may be incurred in separating a joint at which the screw thread is corroded. Even though the connector device may have been given a protective coating, e.g. by galvanising, typically that will have been removed from a localised surface area when machining to form the screw-threaded opening.

Various proposals have been contemplated for protecting the screw threaded opening against corrosion, but up to the time of the present invention these have not been successful, or add significantly to costs.

In one of its aspects the present invention seeks to provide a connector device which has an improved resistance to the effects of corrosion.

The present invention provides a connector device comprising a tubular body portion open at at least one end and having an opening in the wall of said tubular body portion, said opening being shaped to receive an internally screw-threaded insert fitted into the opening from within the tubular body portion and said opening being arranged to co-operate with a retention region of the insert that is radially outwards of the internal screw-thread whereby the insert may be held captive against rotation in the opening and is prevented from passing directly through the opening. It is envisaged that the connector device will be of a kind having a protective coating which extends over at least a radially outer surface region of the tubular body portion and over a surface that at least in part defines said opening.

The insert may be shaped such that it is inherently able to resist rotation relative to the opening, e.g. upon tightening of a grub screw in the internal screw thread of the insert.

Rotation may be resisted, for example, by providing the insert with one or more outwardly extending lugs the or each of which is arranged to locate in a recess formation in the wall of the tubular body portion. Said lug(s) may serve also to prevent the insert passing directly outwards through the opening.

Alternatively rotation may be resisted for example by providing the insert with an outer surface that is of a non-circular cross-sectional shape, e.g. a square or elliptical shape, and with the opening in the tubular body portion being of a substantially similar non-circular shape.

Preferably a part of the insert is arranged to be a close fit in the opening, e.g. a lug may be a close fit in a recess so that the insert may be pre-fitted to and retained by the connector device body prior to use on site to assemble with an elongate member.

The invention further envisages that at least one of the outer surface of the insert and that surface of the body portion which defines the opening may be tapered so that the insert can be located and retained in the body portion by press fitting in readiness for on site use.

Both of the opening and outer surface of the insert may be tapered, and may have similar taper angles, or one may be tapered and the other may be stepped to provide an edge that makes line contact with the insert.

An interference fit achieved by the use of a tapered surface on at least one of the opening and insert may be utilized also to provide resistance to rotation of the insert in the opening.

The connector device may be of for example cast iron or steel. The opening may be formed during casting or by a subsequent machining operation, and a protective coating, e.g. provided by galvanising or a plastics coating, may be provided subsequent to formation of the opening. The coating preferably covers all of the surface of the connector device.

A suitable material for the insert is a corrosion resistant material such as brass, stainless steel or plastics.

The invention provides also an interconnected assembly in which a connector device of the present invention is secured to an elongate member that extends into said tubular body portion.

Embodiments of the invention are now described by reference to the accompanying drawings wherein:-

Figure 1 is a perspective view of a prior art connector device in situ to join two tubular members;

Figure 2 is a longitudinal section of the connector device of figure 1;

Figure 3 is a longitudinal section of a connector device of the present invention;

Figure 4 is a perspective view of an insert for use with the connector device of figure 3;

Figures 5 & 6 are perspective views of two other inserts for connector devices of the present invention;

Figure 7 is a transverse cross-section of the insert of figure 6 in situ in a connector device (part only shown), and

Figure 8 is a side view of a grub screw for use with a connector device of the present invention.

A known connector device 12 for the in-line connection of two tubes 13,14 has a tubular cast iron body 15 (see figures 1 and 2) provided with a small boss 16 near to each end 17. The bosses 16 each have screw threaded passages 18 which extend through the wall of the body 15 in a direction radially outwards relative to a major longitudinal axis 19 of the connector device.

The device so described is galvanised for protection against corrosion.

Each screw threaded passage provides location for a grub screw 20. By tightening the screws radially inwards to bear firmly against and bite into the outer surfaces of respective end regions of the two tubes 13, 14 a structural connection is formed between the tubes.

A connector device of the present invention as shown in figure 3 has a tubular body portion 25 of a shape corresponding to that of figures 1 and 2 except that the passages 26 extending through the bosses 24 are not screw threaded; they are smooth walled and tapered to narrow with increasing distance from the major axis 27. Each passage 26 is dimensioned to receive a brass insert 28 (see figure 4) having a frusto-conical outer surface 29 the taper angle of which corresponds with that of the passage 26. Each insert has a central screw threaded hole 23 which is fitted with a grub screw (not shown).

Prior to on site use the inserts 28 (and grub screws) are press-fitted into the passages 26; they are fitted from within the central bore 30 of the body portion 25 and pushed radially outwards to create an interference fit which is sufficient to retain each insert 28 in a passage 26 and, preferably, also restrain the insert from rotation in the passage when the grub screw is rotated.

In a modified form (not illustrated) of the embodiment of figures 3 and 4 each passage 26 and outer surface 29 of each insert may be of elliptical or other non-circular cross-sectional shape in contrast to the circular cross-sectional shapes of the corresponding surfaces of figures 3 and 4. Relative rotation of the insert and body is then prevented by virtue of a mechanical interlock, without the need to utilize an interference fit.

Figure 5 shows a variation of the insert of figure 4, the insert 35 having a groove 36 in its outer surface, extending between end regions 37,38. The or each passage in the connector device (not shown) is formed integrally with a rib that extends between the radially inner and outer surfaces of a tubular body portion of the device and that rib is shaped to locate in the insert groove 36 to provide a mechanical interlock for restraint of rotation of the insert relative to the body of the device.

Figure 6 shows another variation of an insert, the insert 40 of this embodiment comprising at one end 41 a pair of diametrically opposed and radially outwardly extending lugs 42. The outer surface 43 of the insert otherwise is of a smooth cylindrical form, and has a central screw threaded passage 44 for a grub screw (not shown).

Figure 7 shows the insert 40 in situ in a connector device 45. The connector device is formed with an opening 46 having a pair of recesses 47 at its radially inner end 48, whereby the opening can accommodate the insert and associated lugs 42. The opening 46 is of a stepped internal diameter, to provide a shoulder 47 which resists movement of the insert through the opening in a direction radially outwards from the major axis of the device 45. Additionally or alternatively outwards movement is resisted by the lugs 42 in engagement with abutment surfaces of the recesses 47.

Figure 7 shows use of a grub screw 49 which is externally screw-threaded along substantially the whole of its length. An alternative grub screw 50 suitable for use in an insert of a connector device of the present invention is shown in figure 8. An outer end region 51 is not screw threaded, the length of that end region optionally being substantially equal to the thickness of the flange region 52 formed in the boss 53 by the opening 46.

CLAIMS:

1. A connector device comprising a tubular body portion open at at least one end and having an opening in the wall of said tubular body portion, said opening being shaped to receive an internally screw-threaded insert fitted into the opening from within the tubular body portion and said opening being arranged to co-operate with a retention region of the insert that is radially outwards of the internal screw-thread whereby the insert may be held captive against rotation in the opening and is prevented from passing directly through the opening.

2. A connector device according to claim 1 and comprising a protective coating which extends over at least a radially outer surface region of the tubular body portion.

3. A connector device according to claim 2 wherein said protective coating extends over a surface that at least in part defines said opening.

4. A connector device according to any one of the preceding claims wherein the insert has a shape which is inherently able to resist rotation relative to the opening.

5. A connector device according to claim 4 wherein the insert comprises at least one outwardly extending lug arranged to locate in a recess formation in the wall of the tubular body portion.

6. A connector device according to claim 5 wherein said at least one outwardly extending lug serves to prevent the insert passing directly outwards through the opening.

7. A connector device according to claim 4 wherein the insert comprises an outer surface of non-circular cross-sectional shape and the opening in the tubular body portion of the connector device is of a substantially similar non-circular shape.

8. A connector device according to any one of the preceding claims wherein at least one of the outer surface of the insert and that surface of the body portion which defines the opening is tapered so that the insert can be located and retained in the body portion by press fitting.

9. A connector device according to claim 8 wherein both of the opening

and outer surface of the insert are tapered and have substantially similar taper angles.

10. A connector device according to claim 8 wherein one of the opening and outer surface of the insert is tapered and the other is stepped to provide an edge that makes line contact with the insert.

11. A connector device according to any one of claims 8-10 wherein an interference fit between a tapered surface and another surface serves also to provide resistance to rotation of the insert in the opening.

12. A connector device according to any one of the preceding claims wherein a protective coating has been formed subsequent to formation of the opening.

13. A connector device constructed and arranged substantially as hereinbefore described with reference to and as illustrated in the accompanying drawings.

The Patent Office

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**Application No:** GB 9512526.6
**Claims searched:** 1-13

**Examiner:** Richard Nicholls
**Date of search:** 5 September 1996

## Patents Act 1977
## Search Report under Section 17

**Databases searched:**

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.O): E2A (AGB) ; F2G (GRX) ; F2M (MB2, MC1, ME)

Int Cl (Ed.6): F16B 7/04, 7/18

Other: Online : WPI

**Documents considered to be relevant:**

| Category | Identity of document and relevant passage | Relevant to claims |
|---|---|---|
| A | GB 2065258 A (PRESS COMPONENTS) see figure 1 | 1 |

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|---|---|---|---|
| X | Document indicating lack of novelty or inventive step | A | Document indicating technological background and/or state of the art. |
| Y | Document indicating lack of inventive step if combined with one or more other documents of same category. | P | Document published on or after the declared priority date but before the filing date of this invention. |
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